



**—HELICOPTERS, INC.**

GULF COAST DIVISION  
LAKE CHARLES, LOUISIANA

## PROCESS SPECIFICATION

PROCESS SPECIFICATION NUMBER: ERA-2001

FABRICATION OF NON-STRUCTURAL INTERIOR COMPONENTS

PREPARED BY:

*John E. Stanley*  
John E. Stanley  
MESH PLASTICS LTD.

DATE: 1/27/87

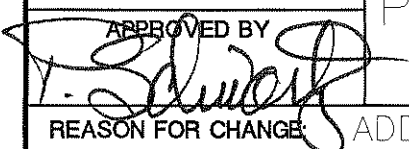
### APPROVALS

MANUFACTURING	QUALITY CONTROL	ENGINEERING	
<i>Herold W. Dickerson</i>	<i>John E. Stanley</i>	<i>David P. E.</i>	MESH
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MATERIALS

<u>MATERIAL</u>	<u>NAME</u>	<u>MANUFACTURER</u>
Resin	Derakane 8084	Dow Chemical Midland, MI
Promoter	Cobalt Napthenate	AKZO Chemie New Brunswick, NJ
Accelerator	Dimethylaniline	Buffalo Colors West Paterson, NJ
MEKP Catalyst	Hi Point 90	Witco Chemical Richmond, CA
	Lupersol DHD 9	Lucidol Chemical Buffalo, NY
Mold Release	PVA	Rexco Carpenteria, CA
	Cerea Mold Release Wax	Ceara Products, Inc. Denver, CO
UV Inhibitor	UV-9	Industrial Chemicals Atlanta, GA
Pigment	CoPlas	CoPlas Fort Smith, AR
	Spartan	Spartan Pigments Houston, Tex.
Gel Coat	Gel Coat	CoPlas Inc. Ft. Smith, Ark.

DATE 6/26/95	<b>ENGINEERING ORDER</b>		E.O. No. B-1	SHT. 1 OF 1
BY T. Harville	TITLE PROCESS SPECIFICATION		DWG. AFFECTED 2001	
APPROVED BY 			ENTERED ON COMPUTER BY: DATE:	
REASON FOR CHANGE: ADD ALT P/N FOR 3/4 & 1 1/2 oz TYPE "E" GLASS MAT (M127)				
<p>3/4 oz TYPE "E" GLASS MAT.      M113-3/4 oz      CERTAINTeed  OR  M127-3/4 oz      CERTAINTeed  WICHITA FALLS, TX.</p> <p>1 1/2 oz TYPE "E" GLASS MAT.      M113-1 1/2 oz      CERTAINTeed  OR  M127-1 1/2 oz      CERTAINTeed  WICHITA FALLS, TX.</p>				

ERA PS ERA-2001REV ADATE 1/25/88MATERIALS

<u>MATERIALS</u>	<u>NAME</u>	<u>MANUFACTURER</u>
3/4 oz Type 'E' glass mat	M113 - 3/4 oz.	Certaanteed Wichita Falls, TX
Kevlar Woven Roving	K 49/051	Knytex Seguin, Tex.
	285 - F100	Hexcel Corp. Dublin, Ca.
	5285 & 5124	Burlington Fabrics Altavista, Va.
Fire Retardant Additive	Nyacol APE-1540	PQ Corp. Ashland, Ma.
Fire Retardant Additive	Decabromodiphenyl Oxide	Ethyl Corp. Magnolia, Ark.

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REV B

DATE 7/8/98

Laminate Manufacture

1. Inspect mold for defects (ie. chips, cracks, crazing, etc. ...). DO NOT proceed until any defect is corrected.
2. Apply mold release agent (s) according to manufacturer's instructions.
3. Apply gel-coat containing UV inhibitor onto mold using a spray gun for a nominal thickness of 10 mils.
4. Allow gel-coat to cure for 4 – 6 hours and become tack free.

**NOTE**

When the laminates must meet the requirements of FAR 27.853, FAR 29.853, FAR 27.855, or FAR 29.855 it will be necessary to add fire retardant additives to the 8084 resin. Mix 24% by weight of additive Decabromodephenyl Oxide to the 8084 resin, then add 7% by weight of Nyacol APE 1540 to achieve the required flame spread rating.

A burn test sample 12 inches square must be supplied with each lot of laminates.

5. Apply one layer of ¾ oz. chopped strand mat on mold surfaces. Saturate with Derakane 8084 resin containing UV inhibitor and pigment. Deaerate with serrated rollers.
6. Apply one layer of Kevlar woven roving over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor and pigment. Deaerate with serrated rollers and plastic squeegees.
7. Apply second layer of ¾ oz. chopped strand mat over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor and pigment. Deaerate with serrated rollers.
8. Allow resin to gel before continuing.
9. Separate FRP item from mold and trim.

Edge Sealing: Cut edges which will receive a coating of paraffinated Derakane 8084 resin.

Final Fit-Up: The pieces to be joined shall be assembled with proper alignment and secured in position with jigs or "hot patches".

## INSPECTION

It is the purpose of the inspection to verify that each part has been fabricated in accordance with and meets the requirements of this specification.

**RESPONSIBILITIES:** It is the responsibility of the fabricator to make available to ERA Helicopter or his authorized representative any or all of the following:

**Records:** Records pertaining to the fabricated part being purchased shall be supplied when requested. These may include:

- Materials specifications
- Part drawings or mold jig
- Materials test results.
- Dimensional verification reports.
- Rework and repair reports.

**MATERIALS:**

Raw materials used for laminates shall be virgin materials and shall be free of contaminants as described on pgs. 9, 10, 11, and 12.

**FABRICATED PARTS:** The parts to be inspected shall be properly located and positioned, and shall be in condition to permit safe and thorough inspection. Reasonable means shall be provided to permit the inspector to visually examine the entire inner and outer surfaces of the part.

Allowable defects are listed on pgs. 7 and 8.

The following inspection tools and equipment shall be made available for use by the inspector.

- Barcol hardness tester.
- Acetone squeeze bottle with acetone.
- Extension cord with ground fault switch.
- A vapor tight inspection light.
- Thickness gauge.

## INSPECTION

TEST OF FINISHED  
EQUIPMENT:

The following basic tests shall be included as a minimum in the Acceptance Inspection.

Barcol Hardness Test - A test of resin cure shall be made in accordance with ASTM D2583. Take 10 readings, discard highest and lowest reading and average the remaining. The minimum acceptable average reading is 30.

Surface Cure Test - An acetone test shall be used to detect surface inhibition on surfaces exposed to air during cure. The procedure that shall be used is the following: rub a few drops of acetone on the surface and check for tackiness after the acetone has evaporated. Persistent tackiness indicates incomplete cure.

Dimensions - The inspector shall be provided with copies of all approved drawings or mold jigs.

## APPLICABLE DOCUMENTS:

## ASTM Standards

C 581-74-Test Method for Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures.

D 638-77a-Test method for Tensile Properties of Plastics.

D 790-71-Test Methods for Flexural Properties of Plastics and Electrical Insulating Materials.

D 883-78a-Definitions of Terms Relating to Plastics.

D 2583-75-Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.



## ALLOWABLE DEFECTS

Defect	Surface inspected	
	Mold Side	Non-finished Side
Cracks	None	None
Crazing (fine surface cracks)	None	Max dimension 1/2 in., max density 5 per sq. ft. min 2 in. apart
Blisters(rounded elevations of the laminate surface over bubbles)	None	Max 1/4 in., dia x 1/8 in. high, max 1 per sq ft, min 2 in. apart
Wrinkles and solid blisters	Max deviation, 20% of wall thickness, but not exceeding 1/8 in.	Max deviation, 20% of wall thickness but not exceeding 1/8 in.
Pits(craters in the laminate surface)	Max dimensions, 1/8 in. dia x 1/32 in. deep. Max number, 10 per sq ft	Max dimensions, 1/8 in dia x 1/16 in deep, max density 10 per sq. ft.
Surface porosity(pin-holes or pores in the laminate)	None	Max dimensions, 1/16 in dia x 1/16 in deep, max density 10 per sq. ft.
Chips	None	Max dimension of break, 1/4 in, and thickness no greater than 20 percent of wall thickness, max density 1 per sq ft
Dry spot(nonwetted reinforcing)	None	Max dimension, 2 sq in. per sq ft
Entrapped air (bubbles or voids in the laminate)	1/16 in max dia., 10 per sq in. max density, but none within 1/32" of the surface	1/8 in. max dia, 4 per sq in. max density; 1/16 in. max dia. 10 per sq in. max density

## ALLOWABLE DEFECTS

Defect	Surface inspected	
	Mold Side	Non-finished Side
Exposed Glass	None	Okay. Sand to remove sharp edges.
Burned Areas	None	None
Exposure of cut edges	None	Okay. Sand smooth.
Scratches	None	Okay. Sand smooth.
Foreign Matter	None	1/16 in dia, max density 1 per sq. ft.

## FIBERGLASS CHOPPED STRAND MAT

## 1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass chopped strand mat used by the fabricator.

## 2.0 Definitions

2.1 Chopped Strand Mat - Chopped strand mat is made from randomly oriented glass strands which are held together in mat form using a binder. Each strand contains a sizing.

## 3.0 Requirements

3.1 Visual Requirements - Each roll of chopped strand mat shall be inspected to insure it is consistent in color, texture and appearance. It shall be free from surface irregularities, fluffy masses, dirt spots or other foreign material; water spots, knots, binder spots larger than 2" in diameter, clumps of strands and tears or holes which may result from removal of defects.

## 3.2 Physical Requirements

3.2.1 Weight - The square foot weight of the mat shall be measured for each carton of mat used. All specimens shall fall within the range specified for the product.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

## FIBERGLASS CHOPPED STRAND MAT

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

- (a) Form of material
- (b) Manufacturer
- (c) Manufacturer's product description including binder type (treatment)
- (d) Manufacturer's product code
- (e) Production date, if available, or production code on carton.
- (f) Property measured and value recorded
  - \* Visual inspection
  - \* Width
  - \* Thickness
  - \* Packaging
- (g) Job number (Internal Fabricator Control Number)
- (h) Fabricated part identification number

## KEVLAR WOVEN ROVING

## 1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize kevlar woven roving used by the fabricator.

## 2.0 Definitions

2.1 Kevlar Woven Roving - Kevlar fiber rovings woven into a heavy weight fabric.

2.2 Wrap Ends - The rovings which run in the longitudinal direction of the fabric, i.e., along the roll length of the fabric.

2.3 Fill Picks - The rovings which run in the transverse direction of the fabric, i.e., across the roll length of the fabric.

2.4 Leno Strands - A pair of warp ends at each edge of the woven fabric. One Leno warp end is always over each fill pick while the other Leno warp end is always under the fill pick. The Leno strands define the edges of the woven field and serve to stabilize the edges of the fabric.

## 3.0 Requirements

## 3.1 Visual Requirements

3.1.1 Dirt Spots - Defined as all foreign matter, dirt, grease spots, etc. - The average number of dirt spots (1/16" to 3/4" in diameter) per 100 lineal feet shall be 6 or less. All rolls shall be free of dirt spots in excess of 3/4" diameter.

3.1.2 Warp Ends - All rolls shall be free of missing warp ends for more than two consecutive feet.

3.1.3 Fill Picks - All rolls shall be free of consecutive missing picks in excess of five, or more than eleven missing picks, either individual picks or any combination of individual and multiple (2, 3, 4, or 5) picks, in any consecutive 100 lineal feet.

3.1.4 Fuzz Clumps and Loops - The product is designed to exhibit proper laydown and shall be free of fuzz clumps or loops exceeding one inch in height from the surface.

## KEVLAR WOVEN ROVING

## 3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll of kevlar woven roving shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the kevlar woven roving unusable.

3.3.1 The kevlar woven roving shall be packaged in an unbroken carton as shipped from the manufacturer's factory. The kevlar woven roving used shall not be repackaged in the distribution of the kevlar woven roving after the manufacturer has shipped the kevlar woven roving.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

- (a) Form of material
- (b) Manufacturer
- (c) Manufacturer's product description including binder type (treatment)
- (d) Manufacturer's product code
- (e) Production date, if available, or production code on carton.
- (f) Property measured and value recorded

- \* Visual inspection
- \* Width
- \* Thickness
- \* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number